

Tiffany, Bruce

From: Tiffany, Bruce
Sent: Wednesday, October 12, 2005 5:20 PM
To: Walker, Dana; Grothkopp, Fritz; Heinz, Dana; Gudeman, Jack
Cc: Hulsizer, Elsie; Elliott, Colin
Subject: LDW Passive Deposition Sampling - Phase 2 - Sampling and Analysis Plan

Rain Sampling Team:

Here is the sampling and analysis plan (SAP) for the Phase 2 rainfall sampling in the Lower Duwamish:



LDW-Phase2-SAP1.
doc



Phase2-PDS.ppt



SampSites-P2.pdf

Thanks to the laboratory folks for the constructive input on the draft SAP. The edits helped to fill some gaps in the document.

One thing I didn't update are the "Locator" fields in Table 1. I plan to update the table after we get Latitude/Longitude coordinates for the locators.

I am hoping we can get the samplers placed in the field within the next two weeks. For those of you on the team, please let me know if this is feasible for you.

Thanks,

Bruce

Lower Duwamish Source Control – Sampling and Analysis Plan Passive Air Deposition Sampling – Phase 2

Introduction

This sampling and analysis plan (SAP) covers the second phase of air deposition sampling for the Lower Duwamish Source Control project. The first phase of sampling identified the relative difference of air deposition flux values between Duwamish Valley stations and a station that approximates background levels for Puget Sound. The focus of this sampling phase is to evaluate the seasonality of air deposition of chemicals of concern onto surface areas that are tributary to the Lower Duwamish Waterway.

Air deposition of chemicals of concern can occur through either “dry” or “wet” deposition. Dry deposition is an atmospheric process where gaseous or particulate phase contaminants deposit directly on a surface. Wet deposition is an atmospheric process where gaseous or particulate phase contaminants become dissolved or interspersed in an aqueous suspension that then deposits on a surface (e.g., rainfall).

Dry deposition is generally evaluated by use of high-volume (i.e., “Hi-Vol”) samplers. Wet deposition is generally evaluated by use of a sampler that only collects precipitation when rainfall is occurring. It is common to find both types of samplers in an air deposition sampling station. Because of the complexity and expense of developing a full sampling station, passive air deposition sampling was selected for this phase of the project.

Passive air deposition sampling, for the purpose of this testing, consists of a large diameter polypropylene funnel attached to a glass container. Unlike dry deposition sampling, no vacuum is applied to draw air into the sampler. This sampler is designed to collect rainfall (i.e., wet deposition) although some dry particulate also will be collected.

Sampling

Stations

The stations for this phase of testing are identified on **Figure 1** (attached) and in **Table 1** below.

Table 1 – Sampling Stations

Station ID	Owner	Locator	Location
BW	WDOE		Beacon Hill, 15th S & Charlestown, Seattle
CE	PSCAA		Duwamish, 4752 E. Marginal Way S., Seattle
DZ	WDOE		Georgetown, 6431 Corson Avenue S., Seattle
SPCC	Seattle		South Park Community Center, 8319 8th Ave. S., Seattle
KCIA	KC		Terminal – King County International Airport, 7277 Perimeter Rd., Seattle

Notes: WDOE - Washington State Department of Ecology
PSCAA - Puget Sound Clean Air Agency
KC - King County
Seattle - City of Seattle

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A total of five (5) stations will be used for testing. The Puget Sound Clean Air Agency (PSCAA) owns one station and Washington State Department of Ecology (WDOE) owns another two stations. In addition, one sampler will be placed on the rooftop of the South Park Community Center and one sampler will be placed on the rooftop of the King County International Airport terminal.

The field contacts are as follows:

- PSCAA: Matt Harper (T:206-689-4009)
- WDOE: Antony Leo (T: 425-649-7119 – C: 425-941-1655)
- WDOE-Beacon Hill Station (T: 206-764-4296)
- South Park Community Center: Mike Hughes (T: 206-684-7384 – C: 206-423-2837)
- King County International Airport: Raleigh Salazar (T: 206-423-3260) or Rick Renaud (T: 206-296-7427)

Sample Identification

Samples will be identified according to the following convention:

####-##-#####-#####

(Station ID) – (Sample Type) – (Start Date) – (End Date)

- Station ID: 2 to 4 letter identifier as presented in **Table 1**
- Sample Type: 2 digit/letter identifier
 - 01 – Original sample (Most common – used for single samples)
 - BK – Equipment blank
- Start Date: 6 digit identifier of sampling start date (MMDDYY)
- End Date: 6 digit identifier of sampling end date (MMDDYY)

Example: CE-01-102705-112205 (Duwamish Station – Original Sample – Start: Oct. 27, 2005 – End: Nov. 22, 2005)

Sampler Preparation

The passive deposition sampler consists of the following components:

- 1.05-ft diameter polypropylene funnel w/lower stem removed.
- 0.5-ft diameter stainless steel funnel.
- 2.5-gallon glass carboy.
- Natural twine for funnel support.

Photographs of the passive deposition sampler are provided in **Attachment A**.

The components of the passive deposition sampler will be cleaned at the King County Environmental Laboratory (KCEL) prior to assembly. The glass carboy then will be wrapped in aluminum foil to minimize the photo-degradation of chemicals of concern. Prior to placement in the field, a KCEL chemist will add any required spikes to the sampler.

The sampler is now ready to collect precipitation.

Note: No preservative will be added to the samplers. Initial testing of the passive deposition samplers indicated that biodegradation of chemicals of concern is not significant. However, spikes will be added to each sampler to assess the loss of target analytes during the course of sample collection and analysis.

Sampling Frequency

Samples will be collected from October 2005 to October 2006. Monthly sampling intervals are anticipated, depending on rainfall. The goal is to collect between 2 to 6 liters of precipitation. The IW Engineer will monitor the precipitation of SeaTac International Airport and determine when it is time to retrieve the samplers from the stations.

When removing a given sampler from a station, a new sampler must be installed in its place.

Field Quality Assurance

Equipment Rinse Blanks

For the first three (3) rounds of passive deposition sampling, equipment rinse blanks will be collected at KCEL for each individual sampler. The equipment rinse blanks will be collected following pre-deployment equipment cleaning (see **Attachment B**) by pouring two (2) liters of purified laboratory water through the sampling apparatus to be used for a given sampling station. The same portion of the deuterated spike also will be added to each equipment blank. For the first round, a wipe test also will be collected on each funnel following the equipment cleaning but just before the equipment blank is collected. The equipment rinse blank will then reflect the station it is to be used on as well as the date the rinse blank was collected.

Example: Equipment rinse blank conducted on October 26, 2005 for a sample to be collected at the Beacon Hill station (Equipment Rinse Blank ID: BW-BK-102605-102605). This same sampler is then used at the Beacon Hill station for a sample collected between October 27, 2005 and November 22, 2005 (Sample ID: BW-01-102705-112205). The equipment rinse blank and its associated blank wipe test will use the same ID # but will be distinguished by the matrix code.

The IW Engineer will review the first three (3) rounds of sampling data to determine if equipment rinsate blanks need to be collected for further sampling rounds. Water and wipe test results for the equipment blanks will not be used to qualify the reported values for the associated deposition samples but will be discussed in a lab narrative.

Deuterated Spikes

Prior to placement in the field, each sampler will be spiked with a mixture containing deuterated analogs of selected PAH and phthalates. This spike mixture will be added to the carboy of each of the samplers by a chemist at KCEL. The intent of the spike is to provide some indication of the stability of selected target parameters while in the carboy, during the deployment. The spike will consist of a solution, in acetone, of the following deuterated PAH/phthalate compounds. The mass of each compound added in the spike will be 500 nanograms (ng).

- Acenaphthylene-d8
- Anthracene-d10
- Benzo(a)pyrene-d12
- Dimethylphthalate-d6
- Fluorene-d10

- Pyrene-d10

Field Notes

A separate "Rite in the Rain" field notebook will be maintained for each station. Each notebook will contain the following information:

- Layout diagram of station with location of sampler(s) identified. (Note: No scale required for layout diagram.)
- Sample collection – start date/time
- Sample collection – stop date/time
- Sample identification
- Observations

Sample Analysis

Samples removed from the stations will be delivered to KCEL within the same day they are collected. King County Industrial Waste Program chain-of-custody procedures will apply. It is expected the volume of water to be analyzed will be 2 to 6 liters. Volumes greater than 7 liters may exceed the capacity of the method.

Once received at KCEL, the water level of each sample carboy will be marked for recording of sample volume. The samples then will be extracted by use of JT Baker C18 solid phase extraction cartridges and analyzed for PAH and phthalates according to EPA Method 8270 or 8270-SIM (selected ion monitoring). The amount of water used for analysis will be reported based on the volume of water collected following elution through the extraction cartridge.

For the first three (3) rounds of passive deposition sampling, wipe samples will be conducted at KCEL on the funnels of each individual sampler. The IW Engineer will review the first three (3) rounds of wipe test data to determine if wipe samples need to be collected for further sampling rounds.

The following compounds will be analyzed:

PAHs

2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene

Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)Pyrene
Naphthalene
Phenanthrene
Pyrene

Phthalates

Benzyl Butyl Phthalate
Bis(2-Ethylhexyl)Phthalate
Di-n-Butyl Phthalate
Di-n-Octyl Phthalate
Diethyl Phthalate
Dimethyl Phthalate

Laboratory Quality Control

Method blanks (MB) will be analyzed for both water and wipe tests at a frequency of one set per extraction batch. The assumed sample volume for the water method blank will be 2 liters. Sample and equipment blank data associated with water and wipe test method blanks will be qualified with a B flag whenever the reported value for the sample and equipment blank is less than 10 times the amount detected in the method blank.

A Spike Blank (SB) and Spike Blank Duplicate (SBD) will be prepared for each batch of water and wipe samples. Recovery acceptance limits are 10 to 150% for all parameters. The volume used for the water spike blanks will be 2 liters.

Data Reporting

Sample results will be reported to the IW Staff Engineer for review.

Station locations will be identified by the LIMS locator used with each deposition sample. Equipment blanks (both water and wipe tests) will be associated with the BLANK1 locator. Each individual sample identification, as described above, will be reported in LIMS under the Client Locator parameter.

Data for water samples will be reported in units of micrograms per liter ($\mu\text{g/L}$). The volume of water analyzed (Amount Analyzed in LIMS) will also be reported so that the mass of each parameter measured in each carboy can be calculated. Wipe test results will be reported in units of μg . This value represents the total mass of each parameter measured by the wipe test.

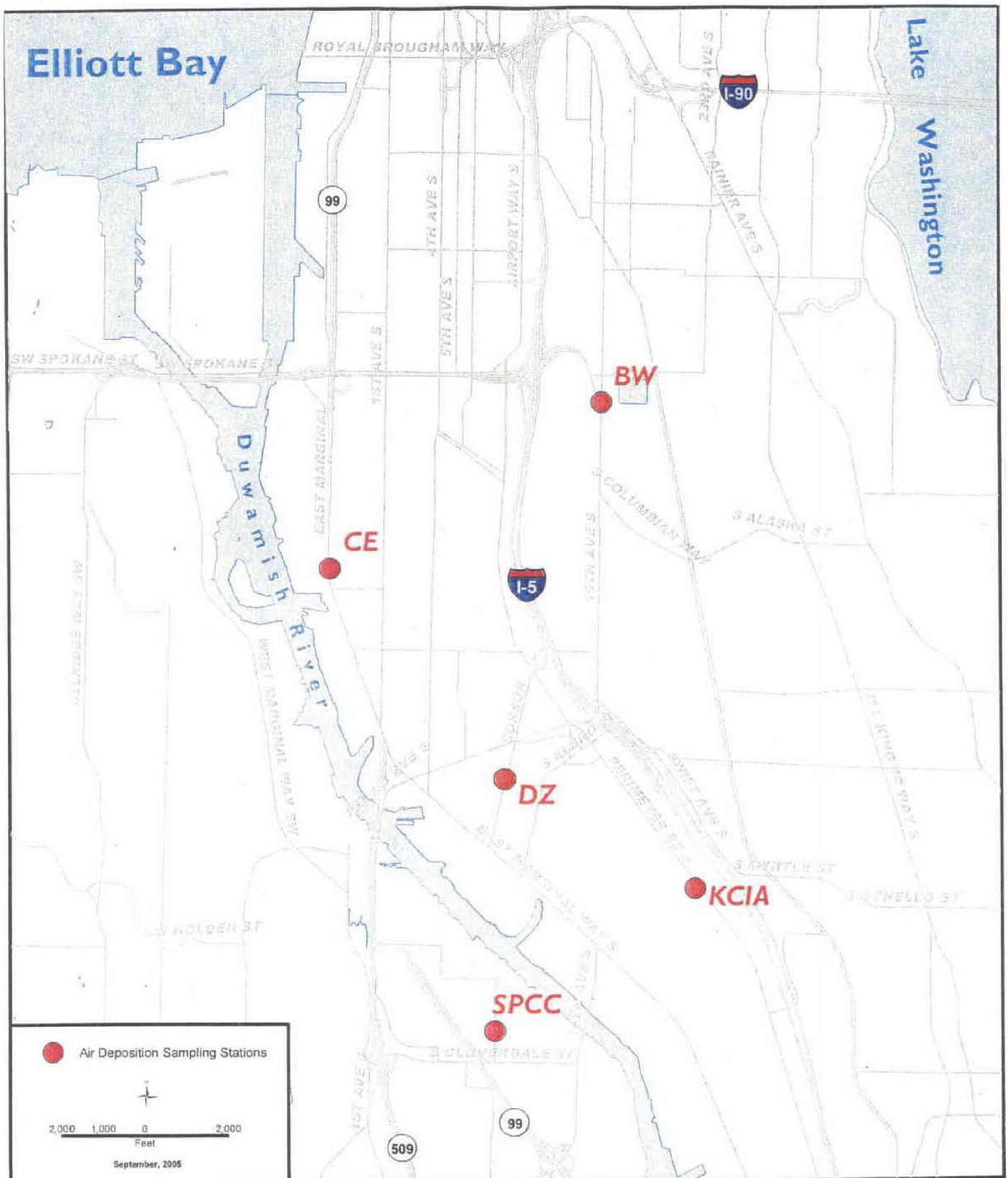
Table 2 presents the expected method detection limits (MDLs) and reporting detection limits (RDLs) for the analysis of 2 L of a water sample and for a wipe test.

Table 2 - Method Detection Limits (MDLs)

Parameter	2 L Water Samples*			Wipe Test Samples		
	Units	Mdl	Rdl	Units	Mdl	Rdl
2-Methylnaphthalene	µg/L	0.005	0.010	µg	0.01	0.02
Acenaphthene	µg/L	0.010	0.020	µg	0.01	0.02
Acenaphthylene	µg/L	0.005	0.010	µg	0.01	0.02
Anthracene	µg/L	0.005	0.010	µg	0.01	0.02
Benzo(a)anthracene	µg/L	0.005	0.010	µg	0.01	0.02
Benzo(a)pyrene	µg/L	0.008	0.015	µg	0.02	0.04
Benzo(b)fluoranthene	µg/L	0.010	0.020	µg	0.02	0.04
Benzo(g,h,i)perylene	µg/L	0.010	0.020	µg	0.02	0.04
Benzo(k)fluoranthene	µg/L	0.010	0.020	µg	0.02	0.04
Benzyl Butyl Phthalate	µg/L	0.005	0.010	µg	0.05	0.10
Bis(2-Ethylhexyl)Phthalate	µg/L	0.005	0.010	µg	0.05	0.10
Chrysene	µg/L	0.005	0.010	µg	0.01	0.02
Di-N-Butyl Phthalate	µg/L	0.005	0.010	µg	0.05	0.10
Di-N-Octyl Phthalate	µg/L	0.015	0.030	µg	0.05	0.10
Dibenzo(a,h)anthracene	µg/L	0.010	0.020	µg	0.02	0.04
Diethyl Phthalate	µg/L	0.015	0.030	µg	0.05	0.10
Dimethyl Phthalate	µg/L	0.005	0.010	µg	0.05	0.10
Fluoranthene	µg/L	0.005	0.010	µg	0.01	0.02
Fluorene	µg/L	0.005	0.010	µg	0.01	0.02
Indeno(1,2,3-Cd)Pyrene	µg/L	0.010	0.020	µg	0.02	0.04
Naphthalene	µg/L	0.015	0.030	µg	0.02	0.04
Phenanthrene	µg/L	0.010	0.020	µg	0.01	0.02
Pyrene	µg/L	0.005	0.010	µg	0.01	0.02

*The MDL and RDL values reported for each water sample will vary according to the volume analyzed. Volumes larger than 2 L will have proportionally lower values while sample volumes less than 2 L will have proportionally higher values. It is expected that the method blank and equipment blanks will contain 2 L of water.

Figures



King County
 Department of
 Natural Resources and Parks
**Wastewater Treatment
 Division**

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 Shaun O'Neil - September 21, 2005

Figure 1
**Air Deposition
 Sampling Stations**

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Attachment A

Photographs of Phase 2 Passive Deposition Sampler

Phase 2 Passive Deposition Sampler

- Complete Sampler
(Presented w/o aluminum foil in order to see sampler components)

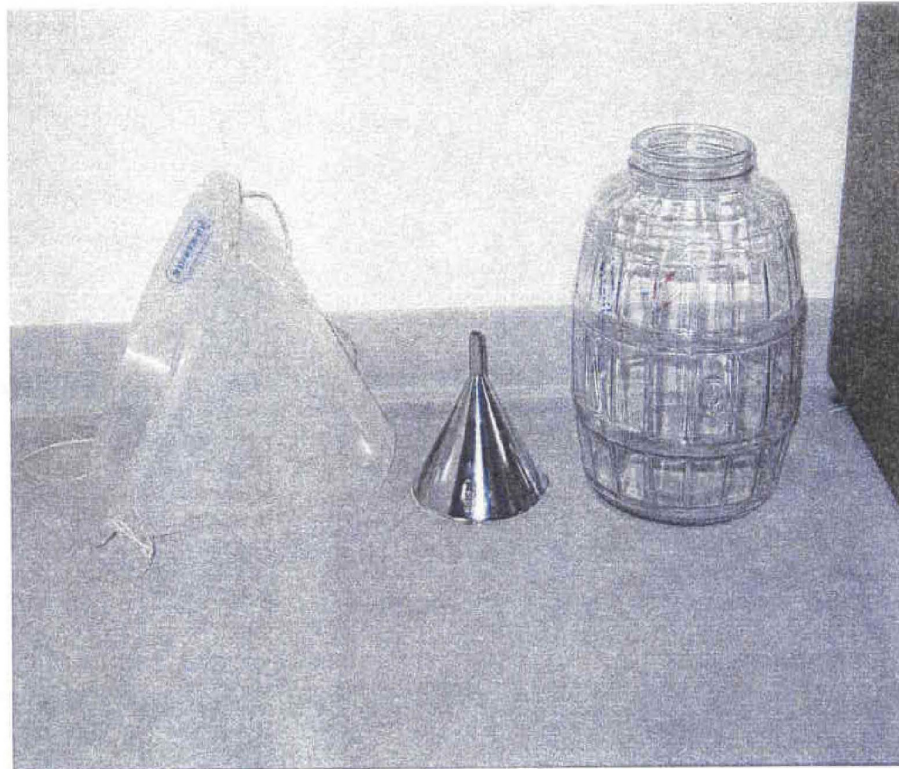


Phase 2 Passive Deposition Sampler

Sampler

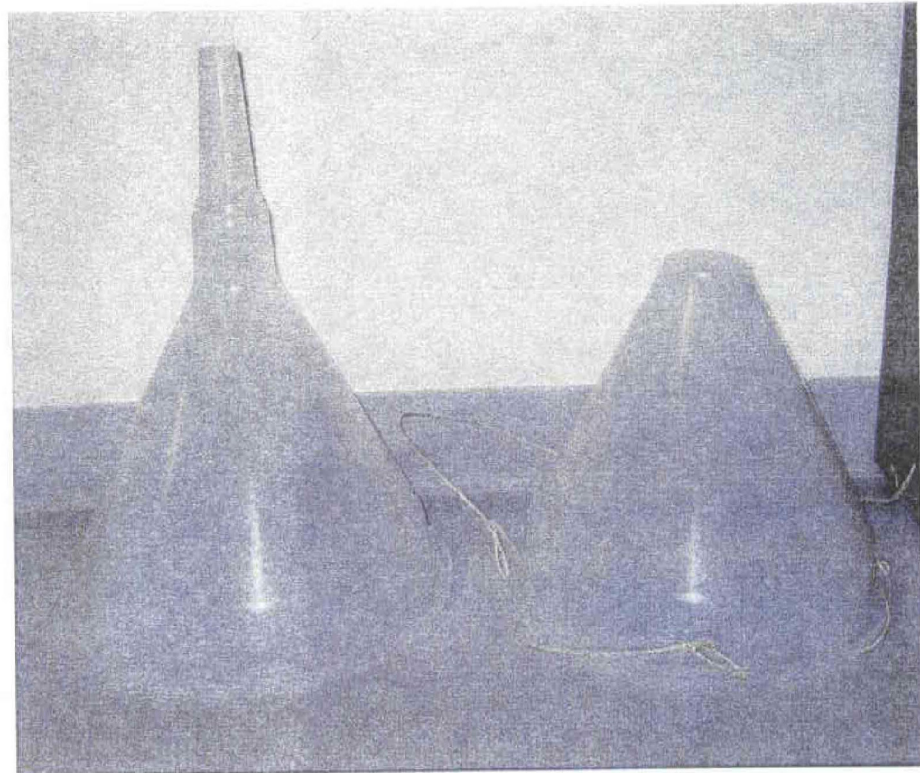
Components

- 12-inch diameter polypropylene funnel (w/natural twine added for support of apparatus)
- 6-inch diameter stainless steel funnel
- 2.5-gallon glass carboy



Phase 2 Passive Deposition Sampler

- Left:
Polypropylene
funnel as
received from
manufacturer
- Right:
Polypropylene
funnel
w/lower
portion
removed



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Attachment B

Equipment Cleaning Procedure

I. Pre-deployment equipment cleaning

A. Glass carboys

Hand-wash with Detergent 8 using a brush. Rinse well with hot water to remove all traces of soap. Place in 5% nitric acid soak overnight. Rinse with hot water 3X and RO water 3X and then dry.

Place the carboy in the fume hood. Using a squirt bottle filled with acetone, rinse all interior surfaces (including the rim of the carboy mouth) 3X. Pour the acetone rinses into a beaker for disposal. Invert the carboy over a wire rack (from the Heinke Washer) to allow the residual acetone to evaporate.

After the acetone has evaporated, repeat the rinse procedure described above using a squirt bottle filled with methylene chloride. Collect the methylene chloride rinses into a beaker for disposal. Invert the carboy over a wire rack (from the Heinke Washer) to allow the methylene chloride to evaporate. After the residual methylene chloride has evaporated, cover the mouth of the carboy with aluminum foil.

B. Funnel for carboy – stainless steel

Fill a plastic dish tub with hot water and Detergent 8. Use a sponge to wash the interior surfaces of the funnel. Rinse well with hot water to remove all traces of soap. Rinse with RO water 3X and then dry.

Place two previously cleaned carboys in the fume hood. Place the funnel upright in the mouth of the first carboy. Using a squirt bottle filled with acetone, rinse the interior surfaces (including the rim of the funnel) 3X. After the third acetone rinse lift the funnel and rinse the bottom 10 -15 cm of the outside of the funnel 3X with acetone. Place the funnel upright in the second carboy to allow the residual acetone to evaporate. Collect the waste acetone from the first carboy and transfer to the appropriate container for disposal.

After the acetone has evaporated repeat the rinse procedure described above using a methylene chloride. After the residual methylene chloride has evaporated, cover the mouth of the carboy with aluminum foil.

C. Funnel for carboy – Polypropylene

Fill a plastic dish tub with hot water and Detergent 8. Use a sponge to wash the interior surfaces of the funnel. Rinse well with hot water to remove all traces of soap. Place in 5% nitric acid soak overnight. Rinse with hot water 3X and RO water 3X and then dry.

Place two previously cleaned carboys in the fume hood. Place the funnel upright in the mouth of the first carboy. Using a squirt bottle filled with acetone, rinse the interior surfaces (including the rim of the funnel) 3X. After the third acetone rinse lift the funnel and rinse the bottom 10 -15 cm of the outside of the funnel 3X with acetone. Place the funnel upright in the

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second carboy to allow the residual acetone to evaporate. Collect the waste acetone from the first carboy and transfer to the appropriate container for disposal.

After the acetone has evaporated repeat the rinse procedure described above using a methylene chloride. After the residual methylene chloride has evaporated, cover the mouth of the carboy with aluminum foil.

D. Twine for securing funnel assembly to carboy

Prior to set-up of carboy sampling assemblies, twine should be rinsed with methylene chloride in the fume hood and left in fume hood until all methylene chloride has evaporated. Store wrapped in aluminum foil until needed.